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AMENDMENTS TO THE CLAIMS

A detailed listing of all claims that are, or were, in the present application, irrespective of whether the claim(s) remains under examination in the application are presented below. The claims are presented in ascending order and each includes one status identifier. Those claims not cancelled or withdrawn but amended by the current amendment utilize the following notations for amendment: 1. deleted matter is shown by strikethrough for six or more characters and double brackets for five or less characters; and 2. added matter is shown by underlining.

1. (Original) A flow controller assembly for use with a hydraulically-actuated, electrically-controlled fuel injector, comprising:

a flow controller fluidly disposable intermediate an injector control valve assembly and an injector intensifier assembly for controlling flow of actuating fluid to and from the intensifier assembly to effect rate shaping of an injectable quantity of fuel and to effect a reduction of noise generated by stopping of an intensifier piston.

2. (Original) The flow controller assembly of claim 1 having a check valve, the check valve effecting throttling the flow of actuating fluid from the injector control valve assembly to the injector intensifier assembly to effect rate shaping during an initial portion of an injection event.

3. (Original) The flow controller assembly of claim 1 having a check valve, the check valve acting to limit initial stroke motion of the intensifier piston from a return disposition to an extended disposition.

4. (Original) The flow controller assembly of claim 1 having an annular flow passage being selectively openable to effect a relatively high volume fluid communication between the injector control valve assembly and the injector intensifier assembly.

5. (Original) The flow controller assembly of claim 4, the flow controller acting in cooperation with the intensifier piston to selectively open and close the annular flow passage.

6. (Original) The flow controller assembly of claim 5, the intensifier piston acting to close the annular flow passage when the intensifier piston is disposed proximate the flow controller.

7. (Original) The flow controller assembly of claim 4, the intensifier piston having a intensifying stroke and an opposed return stroke, the annular flow passage being a flow conduit for porting actuating fluid to the intensifier piston for at least a portion of the intensifier piston intensifying stroke and for venting actuating fluid from the intensifier piston for at least a portion of the intensifier piston return stroke.

8. (Original) The flow controller assembly of claim 1, the intensifier piston having a intensifying stroke and an opposed return stroke, a dampening orifice being defined in the flow controller, the dampening orifice throttling a venting of actuating fluid from the intensifier piston for a portion of the return stroke of the intensifier piston.

9. (Original) The flow controller assembly of claim 8, the dampening orifice effecting a reduction in the rate of intensifier return stroke motion proximate the flow controller.

10. (Original) The flow controller assembly of claim 8, the dampening orifice effecting a substantially noise free seating of the intensifier piston at the termination of intensifier return stroke motion.

11. (Original) The flow controller assembly of claim 1, the intensifier piston having an actuation surface the flow controller exposing a nominal portion of the actuating surface to actuating fluid during an initial stage of an injection event.

12. (Original) The flow controller assembly of claim 11, exposing a nominal portion of the actuating surface to actuating fluid during the initial stage of an injection event acting to

minimize a force generated on the actuating surface for effecting a reduction of the initial rate of motion of the intensifier piston in an intensifying stroke.

13. (Original) The flow controller assembly of claim 11, the flow controller effecting rate shaping by exposing a nominal portion of the actuating surface to actuating fluid during the initial stage of an injection event to effect a reduction of the initial rate of motion of the intensifier piston in an intensifying stroke.

14. (Original) The flow controller assembly of claim 11, the flow controller gradually exposing a greater portion of the actuating surface to actuating fluid with the passage of time subsequent to initiation of the injection event

15. (Original) A governor plate apparatus for use with a hydraulically-actuated, electrically-controlled fuel injector, comprising:

a flow controller fluidly disposable intermediate an injector control valve assembly and an injector intensifier assembly for controlling flow of actuating fluid to and from the intensifier assembly to effect rate shaping of an injectable quantity of fuel and to effect a reduction of noise generated by stopping of an intensifier piston.

16. (Original) The governor plate apparatus of claim 15, the flow controller having an upper margin, the upper margin defining in part an actuating fluid flow chamber.

17. (Original) The governor plate apparatus of claim 15, the flow controller being disposable in an aperture defined in a body, the flow controller being spaced apart from the aperture to define an annular passage.

18. (Original) The governor plate apparatus of claim 15, the flow controller defining at least three actuating fluid flow passages between the injector control valve assembly and the injector

intensifier assembly, the at least three flow passages being an annular passage, a checked passage, and a throttled orifice.

19. (Original) The governor plate apparatus of claim 18, the flow controller being a return seat for the intensifier piston.

20. (Original) The governor plate apparatus of claim 19, the return seat being a recess defined within an annular lip.

21. (Original) The governor plate apparatus of claim 20, the intensifier piston substantially sealing the annular passage when a portion of the intensifier piston is disposed within the annular lip.

22. (Original) The governor plate apparatus of claim 18, the checked passage being a flow passage defining a seat, a ball valve being translatably disposed in the flow passage and being shiftable between a closed disposition seated on the seat and an open disposition, a selected flow area being defined between the flow passage and the ball valve when the ball valve is in the open disposition.

23. (Original) The governor plate apparatus of claim 22, the checked passage being in flow communication with an actuation surface of the intensifier piston, the checked passage exposing a nominal portion of the actuating surface to actuating fluid when the intensifier piston is seated against a flow controller return seat.

24. (Original) The governor plate apparatus of claim 23, the checked passage being in flow communication with a flow area defined in the lower margin of the flow controller, the flow area being in fluid communication with the actuation surface and exposing the nominal portion of the actuating surface to actuating fluid when the intensifier piston is seated against the flow controller return seat.

25. (Original) The governor plate apparatus of claim 22, the ball valve being seatable on the seat by fluid pressure generated by a return motion of the intensifier piston.

26. (Original) The governor plate apparatus of claim 18, at least a portion of the actuation fluid that is being vented by a return motion of the intensifier piston being throttled by the throttling orifice.

27. (Original) The governor plate apparatus of claim 26, actuation fluid throttled by the throttling orifice acting to retard the rate of return motion of the intensifier piston.

28. (Original) The governor plate apparatus of claim 20, the annular lip having a slot of a selected height dimension spaced from a lower margin of the governor plate, the height dimension affecting the dampening of a return motion of an intensifier piston when a portion of the intensifier piston is disposed within the annular lip.

29. (Original) The governor plate apparatus of claim 28, the return motion of the intensifier piston being dampened when any portion of the intensifier piston is disposed to cover the slot within the annular lip.

30. (Original) The governor plate apparatus of claim 28, the return motion of the intensifier piston being dampened for substantially the full extent of travel of the height dimension of the annular lip above the slot.

31. (Original) A hydraulically-actuated, electrically-controlled fuel injector, comprising:

an injector control valve assembly;

an injector intensifier assembly being selectively in fluid communication with the injector control valve assembly; and

a flow controller fluidly disposed intermediate the injector control valve assembly and the intensifier assembly for controlling flow of actuating fluid to and from the intensifier assembly to effect rate shaping of an injectable quantity

of fuel and to effect a reduction of noise generated by stopping of an intensifier piston.

32. (Original) The fuel injector of claim 31 having a check valve, the check valve effecting throttling the flow of actuating fluid from the injector control valve assembly to the injector intensifier assembly to effect rate shaping during an initial portion of an injection event.

33. (Original) The fuel injector of claim 31 having a check valve, the check valve acting to limit initial stroke motion of the intensifier piston from a return disposition to an extended disposition.

34. (Original) The fuel injector of claim 31 having an annular flow passage being selectively openable to effect a relatively high volume fluid communication between the injector control valve assembly and the injector intensifier assembly.

35. (Original) The fuel injector of claim 34, the flow controller acting in cooperation with the intensifier piston to selectively open and close the annular flow passage.

36. (Original) The fuel injector of claim 35, the intensifier piston acting to close the annular flow passage when the intensifier piston is disposed proximate the flow controller.

37. (Original) The fuel injector of claim 34, the intensifier piston having an intensifying stroke and an opposed return stroke, the annular flow passage being a flow conduit for porting actuating fluid to the intensifier piston at least for a portion of the intensifier piston intensifying stroke and for venting actuating fluid from the intensifier piston at least for a portion of the intensifier piston return stroke.

38. (Original) The fuel injector of claim 31, the intensifier piston having an intensifying stroke and an opposed return stroke, a dampening orifice being defined in the flow controller, the

dampening orifice throttling a venting of actuating fluid from the intensifier piston for a portion of the return stroke of the intensifier piston.

39. (Original) The fuel injector of claim 38, the dampening orifice effecting a reduction in the rate of the intensifier return stroke motion proximate the flow controller.

40. (Original) The fuel injector of claim 38, the dampening orifice effecting a substantially noise free seating of the intensifier piston at the termination of intensifier return stroke motion.

41. (Original) The fuel injector of claim 31, the intensifier piston having an actuation surface, the flow controller exposing a nominal portion of the actuating surface to actuating fluid during an initial stage of an injection event.

42. (Original) The fuel injector of claim 41, exposing a nominal portion of the actuating surface to actuating fluid during the initial stage of an injection event acting to minimize a force generated on the actuating surface for effecting a reduction of the initial rate of motion of the intensifier piston in an intensifying stroke.

43. (Original) The fuel injector of claim 41, the flow controller effecting rate shaping by exposing a nominal portion of the actuating surface to actuating fluid during the initial stage of an injection event to effect a reduction of the initial rate of motion of the intensifier piston in an intensifying stroke.

44. (Original) The fuel injector of claim 41, the flow controller gradually exposing a greater portion of the actuating surface to actuating fluid with the passage of time subsequent to initiation of the injection event.

45. (Original) The fuel injector of claim 31, the flow controller having an upper margin, the upper margin defining in part an actuating fluid flow chamber.

46. (Original) The fuel injector of claim 31, the flow controller being disposable in an aperture defined in a body, the flow controller being spaced apart from the aperture to define an annular passage.

47. (Original) The fuel injector of claim 31, the flow controller defining at least three flow passages between the injector control valve assembly and the injector intensifier assembly, the at least three actuating fluid flow passages being an annular passage, a checked passage, and a throttled orifice.

48. (Original) The fuel injector of claim 47, the flow controller being a return seat for the intensifier piston.

49. (Original) The fuel injector of claim 48, the return seat being a recess defined within an annular lip.

50. (Original) The fuel injector of claim 49 wherein a distal portion of the annular lip has a radial slot, the intensifier piston substantially sealing the annular passage when a portion of the intensifier piston is disposed within the annular lip inwardly of the slot.

51. (Original) The fuel injector of claim 47, the checked passage being a flow passage defining a seat, a ball valve being translatably disposed in the flow passage and being shiftable between a closed disposition seated on the seat and an open disposition, a selected flow area being defined between the flow passage and the ball valve when the ball valve is in the open disposition.

52. (Original) The fuel injector of claim 51, the checked passage being in fluid communication with an actuation surface of the intensifier piston, the checked passage exposing a nominal portion of the actuating surface to actuating fluid when the intensifier piston is seated against a flow controller return seat.

53. (Original) The fuel injector of claim 54, the checked passage being in fluid communication with a flow area defined in the lower margin of the flow controller, the flow area being in fluid communication with the actuation surface and exposing the nominal portion of the actuating surface to actuating fluid when the intensifier piston is seated against the flow controller return seat.

54. (Original) The fuel injector of claim 51, the ball valve being seatable on the seat by fluid pressure generated by a return motion of the intensifier piston.

55. (Original) The fuel injector of claim 47, at least a portion of the actuation fluid that is being vented by a return motion of the intensifier piston being throttled by the throttling orifice.

56. (Original) The fuel injector of claim 55, actuation fluid throttled by the throttling orifice acting to retard the rate of return motion of the intensifier piston.

57. (Original) The fuel injector of claim 49, the annular lip having a selected height dimension, the height dimension affecting the dampening of a return motion of an intensifier piston when a portion of the intensifier piston is disposed within the annular lip.

58. (Original) The fuel injector of claim 57 wherein the annular lip has a radial slot, the return motion of the intensifier piston being dampened when any portion of the intensifier piston is disposed within the annular lip above the slot.

60. (Original) In a hydraulically-actuated, electrically-controlled fuel injector, a method of controlling an intensifier piston, comprising:

controlling flow of actuating fluid to the intensifier piston to effect rate shaping of an injectable quantity of fuel by means of a flow controller; and

controlling flow of actuating fluid from the intensifier piston by means of the flow controller to effect a reduction of noise generated by an intensifier piston as the intensifier piston seats on a return seat.

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61. (Original) The method of claim 60 including throttling the flow of actuating fluid from an injector control valve assembly to the injector intensifier piston for an initial portion of an injection event.

62. (Original) The method of claim 60 including limiting initial stroke rate of motion of the intensifier piston, the intensifier motion being shifting from a return disposition to an extended disposition.

63. (Original) The method of claim 60 including selectively opening an annular passage to effect a relatively high volume fluid communication between the injector control valve assembly and the injector intensifier assembly.

64. (Original) The method of claim 63, including actuating the intensifier piston in cooperation with the flow controller to selectively open and close the annular flow passage.

65. (Original) The method of claim 64, including closing the annular flow passage when the intensifier piston is disposed proximate the flow controller.

66. (Original) The method of claim 63, porting actuating fluid to the intensifier piston through the annular flow passage for a portion of an intensifier piston intensifying stroke and venting actuating fluid from the intensifier piston through the annular flow passage for a portion of the intensifier piston return stroke.

67. (Original) The method of claim 60, including throttling a venting flow of actuating fluid from the intensifier piston for a final portion of the return stroke of the intensifier piston.

68. (Original) The method of claim 67, including reducing the rate of intensifier return stroke motion proximate the flow controller by means of a throttled flow of venting actuating fluid.

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69. (Original) The method of claim 67, including effecting a substantially noise free seating of the intensifier piston at the termination of intensifier return stroke motion by means of a throttled flow of venting actuating fluid.

70. (Original) The method of claim 60, including exposing a nominal portion of an intensifier piston actuating surface to actuating fluid during an initial stage of an injection event.

71. (Original) The method of claim 70, including minimizing a force generated on the actuating surface for effecting a reduction of the initial rate of motion of the intensifier piston in an intensifying stroke by exposing a nominal portion of the actuating surface to actuating fluid during the initial stage of an injection event.

72. (Original) The method of claim 70, including effecting rate shaping by exposing a nominal portion of the actuating surface to actuating fluid during the initial stage of an injection event.

73. (Original) The method of claim 70, including gradually exposing a greater portion of the actuating surface to actuating fluid with the passage of time subsequent to initiation of the injection event

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Claim Rejection under 35 U.S.C. § 102

Claims 1-72 were rejected under 35 U.S.C. § 102(e) as being anticipated by Shafer. Shafer is a device that is concerned with providing an additional vent passage for venting actuating fluid from the injector, particularly under cold operating conditions. The Shafer structure provides no flow control to the intensifier 81, but, in fact, provides an additional venting passageway 24 to low pressure reservoir 14 to enhance flow from the intensifier. By adding additional means of venting the intensifier, Shafer provides structure directly opposed to the controlling structure of the present invention and teaches away from the present invention. Additionally there is no structure or teaching in Shafer to provide rate shaping. It is the controlling of actuating fluid flow to and from the intensifier of the present that provides for the desired rate shaping and noise reduction at the conclusion of an injection event. As noted above, there is no controlling structure in Shafer between the control valve assembly 12 and the intensifier. The present invention expressly provides for flow controlling structure interposed between the injector control valve assembly and the intensifier.

Similarly, the present invention expressly provides for a method of flow controlling between the injector control valve assembly and the intensifier. Such method of control is not provide for in Shafer and, as noted above, Shafer in fact teaches away from it by providing adding additional means of venting the intensifier. They is no consideration of providing for a method of rate shaping in Shafer as distinct from the method of the present invention.

In view of this, it is believed that he present application is not anticipated by the Shafer reference and the rejection is respectfully requested to be withdrawn.